Collaborative Research: Developing the Next Generation of Middle School Science Materials -- Investigating and Questioning Our World Through Science and Technology

Project Summary

Investigating and Questioning our World through Science and Technology (IQWST) brings together scientists; science educators; learning scientists; teacher educators, and specialists in technology and literacy, language, and culture to develop a comprehensive 6th through 8th grade curriculum. The standards-based design approach situates student learning in meaningful, extended investigations, in a project-based science context. The materials will support students in acquiring deep understandings of the concepts, principles, and habits of mind articulated in national science standards, and will support students as they use their knowledge and skills in scientific practices such as modeling, designing investigations, explanation, and argumentation. The project uses learning-goals-driven design, in which learning performances that drive the design of activities and assessments specify how students should be able to *use* the scientific ideas and skills outlined in standards. Design principles are based on research on teaching and learning, and specify the ways in which materials support teacher enactment and student learning. The principles include structuring units around explicit learning goals (articulated as performances); contextualizing inquiry in meaningful problems; supporting the cognitive, social, and language challenges in inquiry; anchoring learning in experiences with phenomena; providing formative assessments of students' understanding, and supporting diverse learners. Materials are organized around driving questions that provide a context to motivate and apply the science students learn. Curricula contain hands-on experiences, technology tools, and reading materials that extend students' first-hand experiences of phenomena and support science literacy. Teacher materials support teacher learning of the science content and pedagogical approaches. The materials include an on-line system that provides video examples of student work and pedagogy in action. Other professional development opportunities will further support teachers as learners. The project also includes development of resources for the community so that learning opportunities linked to classroom activities can occur outside of school. Reviews by expert scientists and Project 2061 will provide formative feedback on scientific accuracy, alignment with standards, and instructional approaches. National field trials will examine the extent to which students meet the learning objectives at each grade level, and will compare performance on a standards-based assessment of 8th graders who have completed the 3-year IQWST curriculum to students from comparable classrooms that use other materials.

Intellectual Merit

The goals of IQWST include developing, testing, and revising the next generation of middle school curricula that support students in learning science content based on national standards, situate learning in project-based investigations, and draw design principles from current findings in research on learning, literacy, instruction and assessment. We will investigate whether students in diverse settings (urban, suburban, and rural) develop deeper understanding of key learning goals using these materials than do students who use conventional materials.

Broad Impact

IQWST will provide the nation with middle school materials that are focused on learning goals, use design principles that promote student learning, and are specified and developed, and field tested across varied sites so that teachers with a variety of backgrounds will be able to use them effectively. In addition, IQWST will help to foster the next generation of curriculum developers by involving several early career scholars in the development effort.